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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/533,932	05/04/2005	Takahiro Nishibayashi	033082M252	8030

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EXAMINER	
FORD, NATHAN K	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/533,932	NISHIBAYASHI, TAKAHIRO	
	Examiner	Art Unit	
	Nathan K. Ford	1709	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 November 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *5/4/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-2, 6-11, 13, 15-18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi, US 6,350,316, in view of Hirose, US 5,762,745.

Claims 1-2, 8-9: Hayashi teaches the following:

- A process section (1) (5, 11-14);
- A transfer section (3) for transferring the substrate to the process section (6, 14-25);
- A transfer mechanism for transferring the substrate between the transfer section and the process section (6, 14-25);
- Multiple process towers (16, 17, the collective area comprising units 11 and 13 in Figure 2, the collective area comprising units 12 and 14 in Figure 2) within the process section (5, 26-35; Figs. 1, 3);
    - Wherein a tower consists of a plurality of stacked process units (elements 11-14, 19-26)
    - Wherein a tower includes a coating unit (12, 13) with a chemical liquid (8, 33-39)
        - Wherein that liquid is a component of the insulating film that coats the substrate (1, 5-8)
    - Wherein a tower includes a heating unit (19, 22, 23) to heat the coated substrate (5, 34-45).

Hayashi does not teach a tower that houses both a coating unit and a heating unit. Rather, each is housed in separate towers adjacent to the other; the effort and time necessitated by the robot to transfer the wafers from the heating to the coating tower is comparable to that necessitated by the transfer of a wafer between units within the same tower. In the first instance, the transfer movement is essentially horizontal; in the latter, the movement is vertical. Both movements require similar effort and time. Accordingly, the applicant's modification to dispose both the coating and heating units within the same tower does not beget a result dissimilar from that achieved by Hayashi.

As such, this modification is a mere rearrangement of parts, which has been held to involve only routine skill in the art and is thereby unpatentable (*In re Japikse*, 86 USPQ 70).

Hayashi does not teach a process tower that is detachable from the process section. Hirose, disclosing a substrate processing apparatus, teaches vertically stacked process units (21-23) that collectively compose the process tower; each unit is individually detachable to enable cleaning or maintenance (3, 39-46; 1, 38-44; claim 1). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to conceive Hayashi's process tower as detachable in the manner taught by Hirose to enable cleaning and maintenance.

Claim 6: Hayashi teaches a substrate transfer section comprising a table for mounting wafer cassettes, wherein the cassettes house semiconductor wafers (6, 14-20). A first, undesignated transfer robot conveys the wafer into a transfer unit (25) in the substrate process section where the wafer is disposed temporarily (6, 20-25). A second transfer unit (18) provides the wafer to a plurality of process units (5, 26-34).

Claim 7: Hayashi manipulates the substrate temperature prior to a coating step with hot plate (22) and cool plate (23) units (5, 39-44; 11, 11-19). The temperature of the coating solvent is maintained at a prescribed temperature (2, 66-67).

Claims 10, 11: Hayashi teaches the forming of different insulating layers on the same wafer (1, 49-50). As specified under claim 1, the first processing unit (13) is disposed within a vertical tower distinct from the tower comprising the second processing unit (12). Each processing unit deposits one coating, respectively (11, 12-20).

Claim 13: Hayashi's substrate passes through a heating chamber (81) before the initiation of the curing step (11, 47ff).

Claim 15: As Figure 3 of Hayashi delineates, only a solitary heating unit (19) is disposed above the curing unit (20). However, even if the units were transposed as the applicant's claim warrants, the same predictable result would be obtained. As such, the modification claimed by the applicant is merely a rearrangement of parts, which entails only routine skill and is unpatentable (*In re Japikse*, 86, USPQ 70).

Claims 16, 18: Figure 3 of Hayashi delineates multiple curing units (20) stacked atop of each other to compose a tower (16).

Claim 17: Hayashi teaches a curing unit (20) disposed adjacent to the substrate process section. The second transfer mechanism described under claim 6 inputs and outputs the substrate from the curing unit (5, 26-34). The curing unit processes the wafer following the application of heat (11, 12-20).

Claim 20: Hayashi teaches a coating unit comprising a horizontal substrate support (45); a chemical liquid supply nozzle (46) (6, 39-41); a cup (42) surrounding the substrate and fixedly attached to, and thus held by, the said substrate support (6, 53-55); and an exhaust port (50) at the cup base (6, 63-64).

As Figure 4 delineates, the exhaust port outlets the waste beneath the process section, but Hayashi is silent as to the destination of the waste. However, Hayashi teaches several processes wherein the collective waste is discharged into a chemical liquid storage tank (31). Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to accumulate waste liquid from the coating section in the same or an additional storage tank to prevent hazardous chemical species from dispersing into an unprotected environment.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Hirose and in further view of Yoshimoto et al., US 2002/0145922.

Although Hayashi does not explicitly acknowledge the presence of a control device corresponding to each and every processing unit [the second coating and solvent exchange units are among those that Hayashi explicitly designates as having controllers (2, 63-67)], such a device must be present inherently to monitor substrate processing. The absence of control devices monitoring the various processes would preclude the processing of the substrate in accordance with predetermined standards.

Hayashi does not teach a tower control apparatus connected to the unit control devices. Yoshimoto discloses a processing apparatus comprising a plurality of process sections, wherein a single controller (104) directs the processing within each section, thereby indicating the suitability of such an arrangement ([0060]). The controller (104) must recognize the individual process units to facilitate processing. Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to augment the unit control devices of Hayashi with the tower controller of Yoshimoto given the latter's indication as to the suitability of such an arrangement.

Claims 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Hirose and Yoshimoto, and in further view of Mahara et al., US 6,309,116.

Hayashi does not teach a device that measures film-thickness. However, Hayashi does address the need to obtain a desired level of film thickness during the coating process, thereby demonstrating the need for a device that can measure such thickness (9, 1-5). Supplementing Hayashi is Mahara, who discloses a substrate processing system.

Mahara avails a device (60) that measures the film-thickness of a wafer following a coating process (6, 42-47; 8, 20-26). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to augment the apparatus of Hayashi with the film-thickness measuring device of Mahara to satisfy the former's need to determine the thickness of wafer-films following a coating process. Given Hayashi's indication as to the significance of achieving the proper film thickness, it would be obvious further to control the coating process according to the thickness level deposited on the wafer.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Hirose and Yoshimoto, and in further view of Akagi et al., US 4,999,215.

As stated under claim 4, Hayashi does not teach a device that measures film-thickness but does address the need to obtain a desired level of film thickness during the coating process, thereby demonstrating the need for a device that can measure such thickness (9, 1-5). Akagi, disclosing a method for the manufacture of a polymide film, avails a heater for evaporation purposes (5, 48ff). The temperature of the within the heater is manipulated according to the readings of a film thickness sensor that measures evaporation rates. Further, Akagi establishes an automatic control system by "forming a negative feedback loop for the film thickness sensor and the power source of the heating means by way of a film thickness control device," (6, 6-8). It would have been obvious to one of ordinary skill in the art at the time the invention was made to augment the apparatus of Hayashi with the film-thickness measuring device of Akagi to satisfy the former's need to determine the thickness of wafer-films following a coating process. Given Hayashi's indication as to the significance of achieving the proper film thickness, it would be obvious further to control the heating process according to the thickness level deposited on the wafer.

Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Hirose and in further view of Akimoto et al., US 5,844,662.

Hayashi's process section is not disposed detachably. Akimoto, disclosing a resist processing apparatus, teaches multiple process sections (10, 20, 30, 40) that are each detachable from the other (3, 5-8; Fig. 1). This disclosure indicates that one of ordinary skill could have predicted with success the conception of a substrate treatment apparatus comprising multiple, detachable process sections to process multiple substrates simultaneously. Thus, it

would have been obvious to one of ordinary skill in the art at the time the invention was made to augment Hayashi with the multiple, detachable process sections taught by Akimoto to process multiple substrates simultaneously.

Claims 14 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Hirose and in further view of Komori et al., US 2001/0015412.

Hayashi's curing unit does not employ an electron beam irradiating mechanism. Komori discloses an electron beam irradiation processing device and uses the device to cure semiconductors layered with an insulating film, thereby indicating the suitability of using an electron beam irradiating mechanism to cure a substrate layered with an insulating film ([0004], [0025], Abstract). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to cure the substrates of Hayashi with electron beam of Komori given the latter's indication toward the suitability of availing an electron beam to cure a substrate layered with an insulating film.

Claim 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Hirose and in further view of Nakai, US 6,071,047.

Hayashi teaches a coating supply source (47) for storing the chemical liquid used in the coating process (5, 22-25). The means that provides the chemical liquid to the supply nozzle (46) from the supply source tank (47) is unspecified, i.e., Hayashi does not teach a pump.

Supplementing Hayashi is Nakai, disclosing an apparatus for feeding a coolant liquid to a workpiece. As Figure 10 delineates, Nakai teaches a pump (P_1) that delivers a liquid to a nozzle (3) from a tank (101); the nozzle disperses the liquid over a workpiece (105) (10, 32-48). Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ a pump in the apparatus of Hayashi in the manner taught by Nakai given the latter's indication as to the suitability of availing a pump to provide a liquid to a nozzle from a tank.

The configuration requirements cited in claims 22 and 23 - arranging the pump "sideward of the chemical liquid tank" or on an "upper side" of the same tank - are nothing more than a rearrangement of parts that a person of ordinary skill could have reasonably predicted given the structure of Hayashi. It has been held that rearranging the parts of an invention entails only routine skill in the art (*In re Japikse*, 86 USPQ 70).

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Hirose and in further view of Barkley et al., US 4,687,907.

Hayashi's process units are each housed in separate enclosures within the tower. Hayashi does not teach an air conduit formed between the heating and coating units. Barkley, disclosing a heating apparatus, teaches heat exchange elements surrounding a heater. Between these units is an air passage that insulates the heat exchange units from the heater to forestall an undesired change in temperature, thereby indicating the suitability of using air to insulate units contiguous to a heating element (2, 35-39). Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to augment the perimeter of Hayashi's heating unit with an air passage as taught by Barkley to insulate contiguous units from the heating device to prevent an undesired temperature change.

Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi in view of Hirose and in further view of Matsukawa et al., US 5,964,954.

Hayashi does not teach an air blowing mechanism. Matsukawa teaches a ventilation pipe (264) that blows air into a substrate-coating chamber (206). A fan (266) subsequently exhausts the air through the bottom of the chamber. Control devices (270, 271) regulate the temperature and humidity (17, 21-38; Fig. 16). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to augment the coating unit of Hayashi with the ventilation and control devices taught by Matsukawa to manipulate the air properties within the coating unit.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan K. Ford whose telephone number is 571-270-1880. The examiner can normally be reached on M-F, 8:30-5:00 EDT. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more

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nkf

MICHAEL B. CLEVELAND
SUPERVISORY PATENT EXAMINER